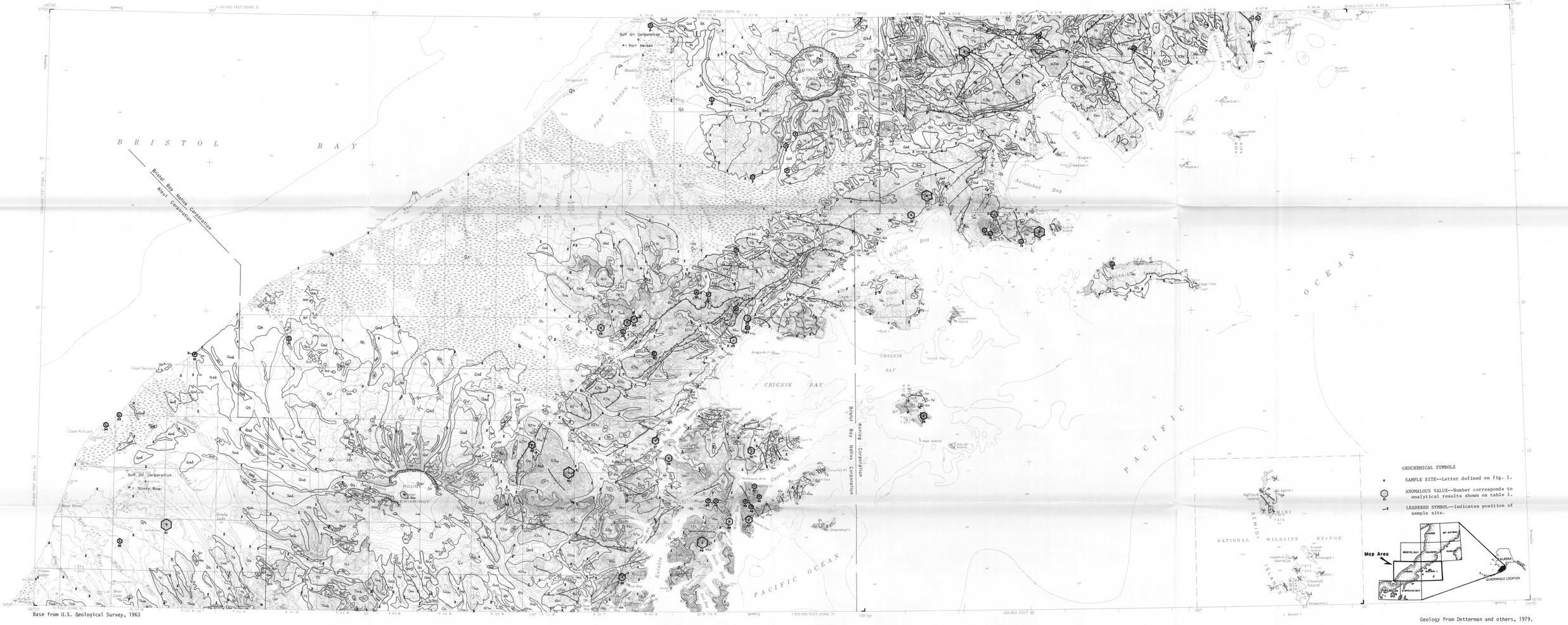
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1053G
FOLIO OF THE CHIGNIK AND SUTWIK ISLAND QUADRANGLES, ALASKA
GEOCHEMICAL MAP, Ag
SHEET 1 OF 2



Base from U.S. Geological Survey, 1963

Geology from Detterman and others, 1979.

GEOCHEMICAL SYMBOLS

- × SAMPLE SITE--Letter defined on fig. 1.
- ⬡ 31 ANOMALOUS VALUE--Number corresponds to analytical results shown on table 1.
- 2 LEADERED SYMBOL--Indicates position of sample site.

SILVER IN NONMAGNETIC HEAVY-MINERAL-CONCENTRATE SAMPLES

SCALE 1:250 000

5 0 5 10 MILES

5 0 5 10 KILOMETERS

DISCUSSION

Introduction

These geochemical maps show the distribution and abundance of silver and arsenic in the Chignik and Sutwik Island quadrangles, Alaska and are part of a folio of maps which were compiled under the auspices of the Alaska Mineral Resource Assessment Program. Background information pertaining to this folio is available in U.S. Geological Survey Circular 802 (Detterman and others, 1980).

The distribution and abundance of silver and arsenic in 623 nonmagnetic heavy-mineral-concentrate samples collected in 1977 and 1978 are shown on a subdued topographic and generalized geologic base. At each sample site a letter has been plotted on the map; letters represent analytical values of silver and arsenic expressed in ppm (parts per million) as defined on the histograms (figs. 1 and 2). Hexagons on the maps denote silver and arsenic concentrations which are considered to be anomalous; increasing symbol size represents increasing ranges of concentrations as defined on figures 1 and 2. Anomalous concentrations of silver and arsenic and associated elements are tabulated by sample site in tables 1 and 2.

Sample media

The topography of the Chignik and Sutwik Island quadrangles is characteristically rugged with short, rapidly flowing mountain streams on the east and west flanks of the Aleutian Range. Where the west flank grades into tidal flats toward Bristol Bay the streams become slow and meandering. Because of earlier work, minus-80-mesh stream-sediment and nonmagnetic heavy-mineral-concentrate samples were considered to be the best sample media for the reconnaissance resource assessment of the area. In all cases the sediment samples were taken from the beds of active stream channels which were draining areas ranging from 6 to 12 km^2. The detrital material and clays composing the sediment are considered to be representative of the composition of the bedrock and colluvium within the confines of the drainage basin upstream from the sample site; analysis of this sediment may reflect the presence of mineralization. The heavy minerals were concentrated by panning the sediment to remove the dilutional effects produced by common rock-forming minerals and rock fragments, and minerals of economic importance were isolated. The concentration of heavy minerals enhances the contrast between background and anomalous values, thus making heavy-mineral-concentrate samples excellent indicators of mineral occurrences within the environment.

Sample preparation and analysis

The heavy-mineral-concentrate samples were panned to remove a percentage of the light minerals and were then air dried. The samples were sieved to minus 20 mesh and separated using bromoform (specific gravity, 2.98) into light- and heavy-mineral fractions. The heavy-mineral fraction was passed through a Frantz Isodynamic Separator[1] to obtain a nonmagnetic fraction at a 0.6 ampere setting. The nonmagnetic fraction was then split; one fraction was used for mineralogical study and the other for spectrographic analysis.

Silver and arsenic in nonmagnetic heavy-mineral-concentrate samples was determined by semiquantitative emission spectroscopy (Grimes and Marranzino, 1968). Detailed descriptions of sample preparation, analytical techniques, and tabulated results for the elements analyzed appear in Detra and others (1978).

Statistical data

The statistics presented on this map were compiled using U.S. Geological Survey STATPAC program (VanTrump and Miesch, 1977). The distribution of silver and arsenic for the entire sample set of nonmagnetic heavy-mineral concentrates is shown on the histograms where frequency is plotted against concentration in ppm (figs. 1 and 2). Summary statistics listed beneath each histogram were calculated using unqualified values. An unqualified value is a reported value which has not been coded with an N, L, or G, where: N indicates not detected; L indicates detected at a concentration below the lower limit of determination; G indicates detected concentration is above the upper limit of determination. Below is a listing of correlation coefficients of silver and arsenic to relevant associated elements. These coefficients (above diagonal) are computed from the number of unqualified pairs within the sample population (below diagonal). A coefficient of 1 indicates a perfect direct correlation and -1 an inverse relation; an asterisk indicates that the correlation coefficient was not computed. Correlation coefficients which are significant with a 5 percent or less chance of error are italicized.

[1]The use of commercial trade names is for descriptive purposes only and does not constitute endorsement of those products by the U.S. Geological Survey.

Correlation coefficients of silver and arsenic with associated elements in nonmagnetic heavy-mineral-concentrate samples

	Fe	Mn	Ag	As	Cu	Mo	Sn	W	Zn	Pb
Ag	.09/57	.06/52	--	.48/7	.10/60	.14/6	-.24/7	.02/5	.13/11	.27/19
As	-.04/21	.07/26	.48/7	--	.36/26	-1.00/2	*/0	.72/4	.72/4	.69/23

Analysis by semiquantitative emission spectroscopy (Grimes and Marranzino, 1968) of representative rock samples collected from the major rock units of this area showed no detectable silver or arsenic at lower detection limits of 0.5 ppm and 200 ppm respectively.

Distribution and nature of geochemical anomalies

The most notable anomaly patterns of silver in nonmagnetic heavy-mineral-concentrate samples occur in the area surrounding Warner Bay (T. 42 S., R. 58 W.), Cape Kumlik (T. 41 S., R. 52 W.), and Cathedral Creek (T. 43 S., R. 60 W.). These areas of possible mineralization are all associated with plutons of quartz diorite or diorite shown as unit Ti on the generalized geologic map. At many of the sample sites in these areas a high concentration of silver correlates with anomalous lead.

Scattered anomalous silver concentrations in heavy-mineral-concentrate samples in these quadrangles are probably related to small intrusive centers ranging in composition from quartz diorite, to diorite, to gabbro. The lack of any significant silver content in some of the stream-sediment samples at some sites suggests that the silver sources are small and that there are strong dilutional effects from the barren source rocks.

Two sample sites designated as numbers 4 and 11 on the silver map are associated with highly anomalous concentrations of gold (table 1). These occurrences are probably derived from vein-type occurrences related to intrusive igneous activity in the immediate area.

Anomalous arsenic concentrations show a generally scattered distribution throughout the quadrangles with a concentrated pattern occurring on Cape Kumlik (T. 41 S., R. 52 W.). Anomalous concentrations are probably associated with plutons and intrusive centers ranging in composition from quartz diorite or diorite to gabbro, shown as unit Ti on the generalized geologic map. A positive correlation exists at sample sites between identified occurrences of arsenopyrite and pyrite (Tripp and Detra, 1979) and anomalous arsenic concentrations determined by semiquantitative emission spectroscopy.

Many of the geochemical patterns have a close spatial correlation with conspicuous aeromagnetic anomalies (U.S. Geological Survey, 1978); of special interest are correlations near Devil's Bay, Cathedral Creek area, and near Cape Kumlik.

References

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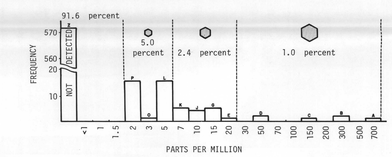

Figure 1.--Histogram for silver in 623 nonmagnetic heavy-mineral-concentrate samples, Chignik and Sutwik Island quadrangles, Alaska, showing: symbols denoting anomalous concentrations, percentage of total number of samples represented by each range, and letters corresponding to concentrations in parts per million. Statistics are based on all unqualified values (52) within the sample population; arithmetic mean, 35.1; standard deviation, 111.7; geometric mean, 7.1; and geometric deviation, 4.0.

Table 1.--*Gold, arsenic, copper, molybdenum, lead, and zinc associated with anomalous silver values in nonmagnetic heavy-mineral-concentrate samples, Chignik and Sutwik Island quadrangles, Alaska*

[Values reported in parts per million; element concentrations determined by semiquantitative emission spectroscopy; N, not detected; L, detected but below value shown; G, detected at a concentration above value shown; lower limits of detection for Au, As, Mo, Pb, and Zn are 20, 500, 10, 20, and 500 ppm, respectively; *, anomalous value for Au, As, Cu, Mo, Pb, or Zn. Map number corresponds to sample site on Ag map]

Map no.	Field no.	Ag	Au	As	Cu	Mo	Pb	Zn
1	SW001	5	N	N	700*	70*	70	7,000*
2	026	5	N	N	300	N	100	500*
3	046	2	N	N	700*	20*	70	L(500)
4	153	300	G500*	N	L(30)	N	N	N
5	C6492	3	N	N	20	N	L(20)	N
6	336	5	N	N	15	N	N	N
7	318	2	N	N	100	N	N	N
8	319	2	N	N	15	N	N	N
9	322	5	N	N	10	N	N	N
10	317	2	N	N	15	N	N	N
11	SW107	700	G500*	N	20	N	200*	N
12	113	7	N	2,000*	100	N	1,000*	N
13	088	10	N	1,500*	500	N	1,000*	N
14	097	5	N	N	2,000*	N	1,000*	500*
15	094	5	N	2,000*	1,000*	N	1,000*	700*
16	093	5	N	N	7,000*	N	300*	N
17	092	300	N	610,000*	3,000*	N	5,000*	1,500*
18	098	5	N	3,000*	200	N	300*	N
19	C6020	2	L(20)	N	100	N	N	N
20	359	2	N	N	2,000*	N	70	N
21	358	2	N	N	1,000*	N	70	N
22	201	2	N	N	3,000*	N	N	N
23	402	10	N	N	5,000*	N	70	N
24	198	5	N	N	70	N	N	N
25	197	10	20*	3,000*	1,000*	N	3,000*	N
26	413	7	N	N	300	20	70	2,000*
27	414	7	N	N	500	N	1,000*	N
28	417	20	N	N	300	N	100	N
29	415	5	N	N	300	N	150*	5,000*
30	411	5	N	N	300	N	100	N
31	307	5	N	N	15	N	200*	N
32	314	2	N	N	20	N	N	N
33	463	5	N	N	20	N	L(20)	N
34	462	5	N	N	20	N	L(20)	N
35	SW131	7	N	N	150	N	70	500*
36	C6145	10	N	N	70	N	1,000*	N
37	407	15	N	N	700*	N	5,000*	N
38	173	15	N	N	300	N	70	N
39	243	15	N	N	1,000*	N	300*	N
40	248	150	N	N	3,000*	N	500*	7,000*
41	141	2	N	1,500*	1,000*	N	70	N
42	140	2	N	1,500*	150	N	70	N
43	139	2	N	N	700*	N	20	610,000*
44	048	2	N	N	500	N	1,500*	N
45	049	2	N	N	1,500*	N	50	N
46	138	2	N	N	1,000*	N	70	7,000*
47	060	15	N	N	100	N	2,000*	5,000*
48	062	15	N	N	620,000*	1,500*	70	N
49	065	50	N	N	2,000*	20*	50	N
50	036	7	N	N	5,000*	200*	20	N
51	445	50	100*	N	30	N	20	N
52	443	5	N	N	20	N	20	N

DISTRIBUTION AND ABUNDANCE OF SILVER AND ARSENIC IN NONMAGNETIC HEAVY-MINERAL-CONCENTRATE SAMPLES, CHIGNIK AND SUTWIK ISLAND QUADRANGLES, ALASKA

By
D.E. Detra and E.F. Cooley

1980

This map is one of a series, all bearing the number MF-1053. Background information relating to this map is published as U.S. Geological Survey Circular 802 available free from Branch of Distribution, U.S. Geological Survey, 1200 South Eads Street, Arlington, VA 22202

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